NPDES PHASE II
STORM WATER QUALITY MANAGEMENT PLAN (SWQMP)
PART B: BASELINE CHARACTERIZATION REPORT

NOVEMBER 5, 2008 UPDATE

Prepared for:

Hamilton County, Indiana
Town of Cicero, Indiana
PERMIT #INR040066

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1.0 INTRODUCTION

As part of the 1987 amendments to the federal Clean Water Act (CWA), the United States Congress added Section 402(p) to the CWA to address the water quality impacts of stormwater discharges from industrial facilities and large to medium municipal separate storm sewer systems (MS4s). Large to medium MS4s were defined as communities serving populations of 100,000 or more and are regulated by the Environmental Protection Agency (EPA) under the National Pollutant Discharge Elimination System's (NPDES) Storm Water Phase I Program.

In addition to these amendments, Congress directed the Environmental Protection Agency (EPA) to issue further regulations to identify and regulate additional stormwater discharges that were considered to be contributing to national water quality impairments. On December 8, 1999, the EPA issued regulations that expanded the existing NPDES Storm Water Program to include discharges from small MS4s in "urbanized areas" serving populations of less than 100,000 and stormwater discharges from construction activities that disturb more than one acre of land. These regulations are referred to as the NPDES Phase II Storm Water Program.

In the State of Indiana, the Indiana Department of Environmental Management (IDEM) is responsible for the development and oversight of the NPDES Phase II Program. The IDEM initiated adoption of the Phase II Rules that were ultimately codified as 327 IAC 15-13 (Rule 13). Rule 13 became effective on August 6, 2003 and requires designated MS4 entities to apply for permit coverage by submitting a Notice of Intent (NOI) and developing Storm Water Quality Management Plans (SWQMPs) through a phased submittal process. The SWQMP is the foundation of a MS4 entity's Stormwater Program. The IDEM's phased submittal requirements for the SWQMP include the following 3 components:

- Part A: Initial Application
- Part B: Baseline Characterization Report
- Part C: Program Implementation Plan

All MS4s were required to submit NOI and SWQMP Part A documents to the IDEM by November 5, 2003. SWQMP Part B and Part C documents were required to be submitted by May 3, 2004 and November 4, 2004, respectively, unless MS4 communities filed for and were granted extensions by the IDEM. By fulfilling these timeline requirements, MS4 communities were issued NPDES Permits that were valid from November 5, 2003 through November 5, 2008.

When submitting initial NOI and SWQMP documentation, designated entities had 3 potential permitting options. Under the first option a community could file individually for a general permit and would be solely responsible for implementing all stormwater requirements as outlined in Rule 13. Under the second option, a community could file individually for general permit coverage, but could chose to work together with other MS4's to fulfill certain regulatory requirements via legally binding agreements. Under the third option, commonly referred to as "Co-Permitting," multiple communities could file for coverage under a single joint permit. Co-Permitting was only allowed if cooperating communities agreed to coordinate on the implementation of 1 or more of the responsibilities of Rule 13 together via legally binding

agreements that outline individual requirements for each MS4 in implementing their Stormwater Program.

During the first permit term, Hamilton County and the Town of Cicero operated under a joint permit (NPDES Permit INR040128) with the City of Carmel. However, as the first permit term came to a close, the City of Carmel decided to seek coverage individually under its own NPDES general permit. The request was approved by the IDEM, and in September of 2008 Carmel filed an initial NOI and SWQMP Part A to the IDEM and was issued their own NPDES Permit Number (INR040150).

While the City of Carmel has decided to operate under its own NPDES Permit, both Hamilton County and the Town of Cicero (Co-Permittees) have decided to continue to work under joint permit coverage. However, as a result of this change, the Co-Permittees were required to submit updated SWQMP Parts B and C. This report has been prepared to address Rule 13 requirements for completing the SWQMP Part B: Baseline Characterization Report and its corresponding certification form for Hamilton County and the Town of Cicero. This report includes the following information:

- An investigation and assessment of the impacts of existing land uses on stormwater runoff within the MS4 Area,
- An identification of sensitive areas within the MS4 Area,
- A review of known existing and available water quality monitoring data for the MS4 Area,
- An identification and assessment of structural and non-structural Best Management Practices (BMPs) within the MS4 Area, and
- An identification of priority areas for the implementation of BMPs, and

The IDEM's SWQMP Part B: Baseline Characterization and Report Certification Checklist is included in **Appendix 1** of this report.

2.0 LAND USE WITHIN MS4 AREA

Rule 13 requires the investigation of land usage and the assessment of structural and non-structural stormwater Best Management Practice (BMP) locations. The following discussion provides an evaluation of land uses within the Co-Permittees' MS4 Area. Structural and non-structural BMPs are identified and assessed in **Chapter 5.0** of this report.

2.1 DESCRIPTION OF MS4 AREA AND RECEIVING WATERS

Hamilton County and the Town of Cicero are working under a joint permit to fulfill requirements of Rule 13. For all Minimum Control Measures (MCM) with the exception of the Illicit Discharge Detection and Elimination (IDDE) MCM, the MS4 Area covered by this permit (herein referred to as Co-Permittee MS4 Area) includes all unincorporated areas of Washington, Delaware, Clay, Noblesville, Wayne, Adams, Whiter River, Fall Creek, and Jackson Township, including the Town of Cicero's incorporated area. The IDDE MCM will only be implemented within unincorporated areas of the County that are located within the Urbanized Area Boundary and within the Town of Cicero's incorporated area. **Exhibit 1** identifies the Co-Permittees' MS4 Area.

The Notice of Intent (NOI) and Stormwater Quality Management Plan (SWQMP) Part A: Renewal Application identified known receiving waters to which the MS4 entities directly discharge stormwater. Since that submittal, the Co-Permittees have slightly amended that list. The receiving waters shown in **Table 2-1** and illustrated in Exhibit 1 include all known Co-Permittee MS4 Area receiving waters.

Table 2-1
MS4 Area Receiving Streams

Entity	Receiving Water
Hamilton County	Bear Creek
Hamilton County	Ames Run
Hamilton County	Bill's Run
Hamilton County	Fall Creek
Hamilton County	Blue Woods Creek
Hamilton County	Flatfork Creek
Hamilton County	Mount Zion Branch
Hamilton County	Taylor Creek
Hamilton County	Thor Run
Hamilton County	Thorpe Creek
Hamilton County	Well Run
Hamilton County	Wheeler and Wheeler
Hamilton County	White River
Hamilton County	Woodruff Branch
Hamilton County	Cicero Creek
Hamilton County	East Fork Sly Run

Hamilton County	Bear Slide Creek
Hamilton County	Hinkle Creek
Town of Cicero	Little Cicero Creek
Town of Cicero	Morse Reservoir
Hamilton County	Mud Creek
Hamilton County	Sand Creek
Hamilton County	Springmill Run
Hamilton County	Stony Creek
Hamilton County	Thomas Hussey
Hamilton County	Grassy Branch
Hamilton County	JM Wagner
Hamilton County	John Underwood
Hamilton County	Kirkendall Creek
Hamilton County	Long Branch
Hamilton County	Marion Blanton
Hamilton County	McMahon-Overdorf Branch
Hamilton County	Hoover Run
Hamilton County	Jones Ditch
Hamilton County	Cheeney Creek
Hamilton County	Clay Creek
Hamilton County	Bee Camp Creek
Hamilton County	FM Musselman
Hamilton County	Finley Creek
Hamilton County	Bills Branch
Hamilton County	Crooked Creek
Hamilton County	Delaware Creek
Hamilton County	Boone Creek
Hamilton County	Eagle Creek
Hamilton County	Williams Creek
Hamilton County	William Lehr Ditch
Hamilton County	William Lock Ditch
Hamilton County	Duck Creek
Hamilton County	Pipe Creek
Hamilton County	Lamberson Ditch
Hamilton County	Weasel Creek
Hamilton County	Kreager Ditch
Hamilton County	Lick Creek
Hamilton County	Little Eagle Creek
Hamilton County	Lion Creek
Hamilton County	Prairie Creek
Hamilton County	Geist Reservoir
Hamilton County	AF Ingerman Ditch
Hamilton County	AJ Myers

Hamilton County	Center Creek
Hamilton County	Cool Creek
Hamilton County	Little Cool Creek
Hamilton County	Carmel Creek
Hamilton County	Eller Run
Hamilton County	Elliot Creek
Hamilton County	Grainger Ditch
Hamilton County	Henley Creek
Hamilton County	Hiway Run
Hamilton County	JW Hawkins
Hamilton County	Will Run

2.2 POPULATION DATA

According to Stats Indiana, Hamilton County is the fastest growing county in the State of Indiana. Between 1990 and 2000, the County experienced a 67.7% population increase from 108,936 people to 182,740 people. Since then the overall population of the County has increased to 261,661. In addition, the population of the Town of Cicero grew by 31.7% from 3,268 to 4,303 between 1990 to 2000. Since then the Town's population has increase to 4,439. **Table 2-2** identifies the 1990, 2000, and 2006 populations as well as the percentage change over that time period for both Hamilton County and the Town of Cicero.

Table 2-2
MS4 Population

MS4 Area	1990 Population (Rank)	2000 Population (Rank)	2007 Population (Rank)	Percent Change
Hamilton County	108,936 (12)	182,740 (6)	261,661 (5)	140.0%
Town of Cicero	3,268 (149)	4,303 (135)	4,439	35.8%

(Census Bureau, 2008)

Growth in Hamilton County is still occurring. Stats Indiana estimates that by 2010, the County's population will be approximately 298,600 which would rank the County as the 4th most populous county in Indiana.

2.3 LAND USE DATA

As shown in **Exhibit 2**, approximately 79% of the Co-Permittees' MS4 Area is in agricultural production and 12% is considered to be urbanized. This data comes from the Indiana Land Cover Data Set, which was created as part of the USGS National Land Cover Characterization Project. The goal of the project was to generate seamless and consistent land cover data for

the entire contiguous United States. The Indiana data was generated in 2001, and is considered to be the most accurate GIS-based land use data available for Hamilton County. **Table 2-3** summarizes the 2001 land use data for the Co-Permittees' MS4 Area.

Table 2-3
Land Use Data

Land use	Area (acres)	MS4 Area (%)
Forest	8,860.21	5%
High to Medium Intensity Development	1,167..57	1%
Low Density Residential	18,347.35.31	11%
Agricultural (Crops and Pasture)	137,417.77	79%
Wetlands	1080.39	1%
Water	2,221.50	1%
Other	4,144.55	2%
Total	**173,239.36**	**100%**

(USGS, 2001)

2.4 WATERSHEDS WITHIN MS4 AREA

Hamilton County and the Town of Cicero are located in the Upper White River Basin, an 8-digit hydrologic unit code (HUC) watershed. As illustrated in **Exhibit 3** and listed in **Table 2-4**, there are 41 subwatersheds (14-digit HUCs) that drain into or from the Co-Permittees' MS4 Area.

Table 2-4
14-Digit Watersheds

Watershed Name	14 Digit HUC	Size* (ac)
Cicero Creek-Bacon Prairie Cr/Buscher Ditch	5120201080060	12,423.00
Duck Creek-Lamberson Ditch	5120201060040	10,330.10
Cox Ditch-Christy/Kigin Ditches	5120201080010	13,177.40
Cicero Creek-Weasel Creek	5120201080070	13,698.60
Prairie Creek-Rearce/McKinzie Ditches	5120201080020	15,135.70
Bear Creek-West Fork Bear Creek	5120201060050	11,022.00
Little Cicero Creek-Bennett Ditch/Taylor Creek	5120201080090	14,382.90
Pipe Creek-Kirkthawenund Camp	5120201050090	14,420.20
Duck Creek-Long Branch	5120201060060	7,227.90
Little Cicero Creek-Teter Branch	5120201080080	13,327.10
Stowers Ditch-Stoker Ditch	5120110010020	9,405.40
White River-Sugar Run	5120201070020	8,011.30
Morse Reservoir-Bear Slide Creek	5120201080110	10,473.30
Hinkle Creek-Jones Ditch	5120201080100	12,870.90
White River-Perkinsville	5120201040100	5,515.40
White River-Dyers Creek	5120201070010	8,304.60

Watershed Name	14 Digit HUC	Size* (ac)
Eagle Creek-Dixon Branch	5120201120010	10,496.60
Eagle Creek-Finley Creek	5120201120030	6,641.00
White River-Mallory Granger Ditch	5120201070030	12,516.60
Stony Creek-William Lock Ditch	5120201070050	10,758.80
Eagle Creek-Kreager Ditch	5120201120020	7,730.00
Little Eagle Branch-Headwaters	5120201120060	10,038.20
Cicero Creek-Sly Run	5120201080120	7,225.30
Cool Creek-Grassy Branch/Little Cool Creek	5120201090030	15,113.20
Stony Creek-William Lehr Ditch	5120201070060	8,800.70
Stony Creek-North Trib (Noblesville)	5120201070070	7,059.20
Mud Creek-Headwaters	5120201110030	16,709.90
Little Eagle Branch-Woodruff Branch	5120201120070	8,683.60
White River-Vestal Ditch/Michener Ditch	5120201090020	11,643.40
Mud Creek-Sand Creek	5120201110040	10,701.70
Fall Creek-Pendleton to Lick Creek	5120201100090	10,212.90
White River-Shoemaker Ditch (Hamilton)	5120201090010	9,455.70
Williams Creek	5120201090060	14,198.70
Thorpe Creek (Geist Reservoir)	5120201100130	6,128.30
Eagle Creek-Long Branch/Irishman Run	5120201120080	11,982.90
White River-Carmel Creek	5120201090040	13,264.60
Lick Creek-Manifold/McFadden Ditches	5120201100110	10,678.40
Fall Creek-Flatfork Creek	5120201100120	7,645.00
Geist Reservoir-Bee Camp	5120201100150	11,121.90
Crooked Creek (Marion)	5120201090070	12,659.60
White River-Haverstick Creek/Howland Dt	5120201090050	11,327.20

*The acreages listed in Table 2-4 represents the entire subwatershed, and is not limited to the portion of the subwatershed within the Co-Permittees' MS4 Area.

2.5 SUMMARY OF LAND USE EVALUATIONS

The effects of land use and land use change on surface runoff, streamflow, and groundwater recharge are fundamental considerations in the practice of stormwater management. Expansion of urban areas significantly impacts the environment in terms of groundwater recharge, water pollution, and stormwater drainage. Urbanization can lead to an expansion of impervious surfaces, which can in turn lead to increases in surface runoff volume, downstream flooding, and detrimental impacts to local waterways. Since each land use has a different impact on stormwater runoff, strategic land use planning can help minimize these impacts.

The US EPA's 2002 *National Water Quality Inventory* (NWQI) identified agricultural land uses as the leading source of non-point source (NPS) pollution and water quality impairments to surveyed rivers and lakes, and the third largest source of impairments to surveyed estuaries. Since agricultural land uses account for approximately 79% of land uses within the Co-

Permittees' MS4 Area, the Co-Permittees should continue to encourage local agricultural producers to implement agricultural BMPs, including, but not limited to, conservation tillage, nutrient and pesticide management, buffer strips, and wetland restoration. This will be accomplished by working with the Natural Resources Conservation Service (NRCS) to target local agricultural producers in the MS4 Area.

In addition, the NWQI identified runoff from urban areas as the leading source of impairments to surveyed estuaries and the third largest source of water quality impairments to surveyed lakes. Since urban land uses account 12% of land uses within the Co-Permittees' MS4 Area, and because the entire County is experiencing rapid urbanization, it will be important for the Co-Permittees to manage growth and development in a way that minimizes potential impacts on water quality. As required by Rule 13, the Co-Permittees have adopted a comprehensive Stormwater Management Ordinance and Stormwater Technical Standards Manual which are designed to minimize the impacts that urbanized areas have on water quality.

3.0 SENSITIVE AREAS

Rule 13 requires the identification of "Sensitive Areas" as locations that should be given the highest priority for the selection of BMPs and the prohibition of new or significantly increased MS4 discharges. The following discussion provides an evaluation of potentially sensitive areas within the Co-Permittees' MS4 Area.

3.1 ERODIBLE SOILS

The Natural Resources Conservation Service (NRCS) uses the soil erodibility index (EI) to provide a numerical expression of the potential for a soil to erode considering the physical and chemical properties of the soil and the climatic conditions where it is located. As a result, the basis for identifying highly erodible land is the erodibility index of a soil map unit.

The erodibility index of a soil is determined by dividing the potential erodibility for each soil by the soil loss tolerance (T) value established for the soil. The T value represents the maximum "tolerable" annual rate of soil erosion that could take place without causing a decline in long-term productivity. As illustrated in **Exhibit 4** and **Table 3-1**, the Co-Permittees' MS4 Area contains approximately 29,035.55 acres (17%) of highly erodible and potentially highly erodible soils.

Table 3-1
Highly Erodible Soils

Soil Abbreviation	Soil Name	Acres
FxC3	Fox	952.99
FnB2	Fox	542.68
HeF	Hennepin	1624.62
MmB2	Miami	19146.57
MmC2	Miami	1999.30
MmD2	Miami	982.11
MoC3	Miami	2370.56
MoD3	Miami	646.17
OcB2	Ockley	770.56
Total		**29,035.55**

- Recognizing the potential water quality impacts associated with disturbing these soils, the Co-Permittees have identified them to be sensitive areas in their Stormwater Technical Standards Manual.

3.2 SOIL SUITABILITY FOR SEPTIC SYSTEMS

As illustrated in **Exhibit 5**, the Hamilton County Soil Survey identifies approximately 159,418. acres (90% of soils) within the Co-Permittees' MS4 Area as "severely limited" for onsite wastewater treatment. The Hamilton County Health Department is charged with permitting and inspecting onsite wastewater disposal systems. Within the Town of Cicero, new developments are required to connect to the Town's sanitary sewer system, if service is readily available. However, when sanitary sewer service is not available, onsite wastewater treatment permits are issued by the Hamilton County Health Department, if site conditions meet State Department of Health standards.

- Sufficient measures are in place to address on-site wastewater treatment in developing and redeveloping areas; however, this information will be considered when implementing public education and illicit discharge detection and elimination activities in areas with known septic system failures or inadequacies within the MS4 Area.

3.3 NATURAL HERITAGE DATA

The IDNR's Division of Nature Preserves maintains the Natural Heritage Data for the State of Indiana. National Heritage Data includes general information on endangered, threatened, and rare species for each Indiana county. According to this data, there are 3 plants, 11 mussels, 1 fish, 1 amphibian, 2 reptiles, 5 birds, and 2 species of mammals listed as endangered, threatened or rare within Hamilton County.

In addition, floodplain and upland forest habitats are listed as High Quality Natural Communities on the Indiana's endangered, threatened, and rare species list for Hamilton County.

Co-Permittee officials are unaware of any waters within their MS4 Area that currently contain threatened or endangered species and their habitats. If endangered or threatened species and their habitats are identified within MS4 receiving waters in the future, the Co-Permittees will consider those locations to be sensitive areas and will update their stormwater program accordingly. Endangered and threatened species are identified in the Co-Permittees' Stormwater Technical Standards Manual as sensitive areas.

3.4 WETLANDS

The National Wetland Inventory (NWI) Map, as illustrated in **Exhibit 6**, identifies potential wetlands within the Co-Permittees' MS4 Area. According to NWI data there are approximately 4,712.71 of wetlands in the Co-Permittees' MS4 Area. It should be noted that the NWI data was generated from infrared photography and has not been field verified. The NWI map should be used only as a reference, not as a definitive answer of whether wetlands are present on a particular site.

The Hamilton County comprehensive Stormwater Management Ordinance and Stormwater Technical Standards Manual, which have been adopted by the City of Cicero, require construction site owners to develop construction plans that include an existing project site layout describing the location and name of all wetlands, lakes, and water courses on or adjacent to the project site.

- The Hamilton County Stormwater Technical Standards Manual requires that a wetland delineation shall be completed in accordance with the methodology established by the U.S. Army Corps of Engineers (COE) if a wetland is suspected on a construction site.

3.5 FLOODPLAINS

The intent of floodplain management is to protect against loss of property, protect human life, and maintain natural beneficial functions of floodplains in helping mitigate flooding and providing habitat and water quality benefits. The Hamilton County Stormwater Technical Standards Manual adopted a policy prohibiting the filling of the land in the floodplain of a regulated drain or any natural stream or watercourse, that has a contributing drainage area of 25 acres or more.

- As the policy referenced above indicates, floodplains are considered sensitive areas as a part of the Co-Permittees' Stormwater Program.

3.6 OUTSTANDING AND EXCEPTIONAL USE WATERS

According to IDEM's listing of Indiana Waters Designated for Special Protection, there are no waters in Hamilton County or the Town of Cicero that have been designated as "outstanding state resource waters" or as "exceptional use waters."

3.7 ESTABLISHED TMDLs

Section 303(d) of the Clean Water Act requires States to identify waters that do not or are not expected to meet applicable Water Quality Standards with federal technology based standards alone. States are also required to develop a priority ranking for these waters taking into account the severity of the pollution and the designated uses of the waters. Once this listing and ranking of waters is completed, States are required to develop Total Maximum Daily Loads (TMDLs) for listed waters in order to achieve compliance with State Water Quality Standards.

According to the 2008 303(d) List of Impaired Streams there are more than 30 water bodies in Hamilton County and the Town of Cicero identified as being impaired. Parameters of concern range from *E.coli*, taste and odor, nutrients, impaired biotic communities, as well as, fish consumption advisories for PCBs. The IDEM is required to develop Total Maximum Daily Loads (TMDLs) for these waterbodies in order to achieve compliance with Water Quality

Standards.

The West Fork White River, Muncie to Hamilton-Marion County Line TMDL was completed in 2004. The report proposes pollutant reductions, requiring between 88% and 98% reductions in *E.coli* loadings from both point and nonpoint sources of pollution. In particular, the report documents the need for a 98% reduction in *E.coli* loadings at the Hamilton-Marion County Line.

In addition, the report documents that the most significant sources of *E.coli* include CSOs, nonpoint source runoff, livestock, and failing septic systems. The report states *E.coli* load reductions from nonpoint sources will require a voluntary approach and the implementation of a variety of BMPs. Recommended BMPs included the following:

- Septic system outreach program and funding to help fix/replace failing systems.
- Identification of failing septic systems by local health departments. Requirements for periodic pumping and inspection of septic systems.
- Livestock exclusion from riparian areas.
- Installation of structural urban BMPs.

In addition to the White River TMDL, the Duck Creek, Pipe Creek, Killbuck Creek, and Stony Creek TMDL for *E. coli* Bacteria has been completed. This report also calls for *E.coli* load reductions ranging from approximately 72% to 93% depending on the reference location in the Stony Creek Watershed.

The TMDL Reports both identify stormwater runoff from MS4s as a source of *E.coli* contamination and both reports indicate that implementation of MS4 Permits will improve water quality and address stormwater impacts in impacted watersheds.

3.8 RECREATIONAL WATERS

The primary recreational Waters located within the Co-Permittees' MS4 Area include Geist Reservoir, White River, and Morse Reservoir.

- These waters and their corresponding 14-digit HUC are considered sensitive areas within the Co-Permittees MS4 Area.

3.9 PUBLIC DRINKING WATER SOURCES

According to Indiana Administrative Code, a public water supply system is a public water supply for the provision to the public of piped water for human consumption, if such system has at least 15 service connections, or regularly serves an average of at least 25 individuals. Within Hamilton County there are 61 active Public Water Supply Systems, all of which utilize groundwater as their drinking water source.

Wellhead Protection
Hamilton County has an existing Wellhead Protection Zoning Ordinance that prohibits certain land uses or land use activities within defined wellhead protection overlay zones. Specifically, the ordinance requires all developments, other than single family homes, to be connected to sanitary sewers and prohibits the storage and handling of any chemicals or fuels in quantities that would pose a risk to groundwater contamination within these areas. In addition, the ordinance requires any stormwater detention/retention facilities to be constructed in a manner that provides an effective barrier to the migration of potential groundwater contaminants. These provisions are also adopted and enforced within the Town of Cicero.

In addition, Hamilton County's Wellhead Protection Program includes a contingency plan that ensures emergency response and spill cleanup activities in response to any spill, leak, or illegal discharge within the County. This program is operated by the Hamilton County Emergency Management Agency with oversight from the Local Emergency Planning Committee (LEPC).

- While Wellhead Protection Areas are sensitive in nature, they are not considered to be sensitive areas in the context of the Co-Permittees' Stormwater Program, as they are already managed through existing Wellhead Protection Ordinances.

Surface Water Protection
The Indianapolis Water Company (IWC) maintains 1 surface water intake on the White River within Hamilton County. The White River North Station, located in the White River – Shoemaker Ditch Watershed, collects its source water from the White River, which is supplemented by Morse Reservoir. In addition, the Indianapolis Water Company also maintains surface water intakes downstream on the White River in Marion County. Like the White River North intake, surface water intakes along White River within Marion County are supplemented with source waters from Morse Reservoir. The IWC also maintains a surface water intake along Fall Creek in Marion County. Water supply to the Fall Creek intake is supplemented by Geist Reservoir.

- In addition to providing the water source for the Indianapolis Water Company, Morse Reservoir, White River, and Geist Reservoir, are designated stormwater receiving waters for the Co-Permittees. As a result the following subwatersheds will be considered priorities for the Co-Permittees' Stormwater Program:

  - Geist Reservoir-Bee Camp (05120201100150)
  - Morse Reservoir–Bear Slide Creek (05120201080120)
  - White River–Shoemaker Ditch (05120201090010)

3.10 SUMMARY OF SENSITIVE AREA EVALUATIONS

As discussed in the sections above, several sensitive areas have been identified as having the potential to impact or be impacted by stormwater runoff from the Co-Permittees' MS4 Area. These areas include highly erodible soils, soils unsuitable for septic systems, wetlands, and

watersheds containing waterbodies used for recreation or public water supply.

The following subwatersheds will be considered priorities for the Co-Permittees' Stormwater Program:

- Geist Reservoir-Bee Camp (05120201100150)
- Morse Reservoir–Bear Slide Creek (05120201080120)
- White River–Shoemaker Ditch (05120201090010)

4.0 SUMMARY OF EXISTING MONITORING DATA

Rule 13 requires a review of known existing and available monitoring data for the MS4 Area receiving waters, including, as applicable, data that can be correlated from chemical, biological, physical, land use, and complaint data. The following discussion provides an evaluation of known and available data for the Co-Permittees' MS4 Area receiving waters.

4.1 IDEM 305(b) REPORT AND 303(d) LIST OF IMPAIRED WATERS

According to the IDEM, Section 305(b) of the Clean Water Act requires the State to assess and report on how well the waters of Indiana support the beneficial uses designated in Indiana's Water Quality Standards. Indiana's Integrated Water Monitoring and Assessment Report (IR) is developed every 2 years to fulfill this requirement and describes the condition of Indiana's lakes and streams. The IR is submitted to the U.S. EPA in even-numbered years.

Based on the results of the IR, IDEM develops their 303(d) List of Impaired Waters, which is a consolidated list of all waterbodies that do not meet State Water Quality Standards. **Table 4-1** below identifies impaired streams for each of the Co-Permittees' 14-digit HUC subwatersheds.

Table 4-1
Impaired Waterbodies

Watershed Name	14 Digit HUC	Impaired Water Body	Type of Impairments
Cicero Creek-Bacon Prairie Cr/Buscher Ditch	5120201080060		*E.coli*
Duck Creek-Lamberson Ditch	5120201060040	Duck Creek	*E.coli*
		Lamberson Ditch	*E.coli*, IBC
Cox Ditch-Christy/Kigin Ditches	5120201080010	Cox Ditch	Algae, IBC, Nutrients
Cicero Creek-Weasel Creek	5120201080070	N/A	N/A
Prairie Creek-Rearce/McKinzie Ditches	5120201080020	N/A	N/A
Bear Creek-West Fork Bear Creek	5120201060050	East Fork Bear Creek	*E.coli*
		West Fork Bear Creek	*E.coli*
Little Cicero Creek-Bennett Ditch/Taylor Creek	5120201080090	Bennett Ditch	*E.coli*
		Cicero Creek	*E.coli*
		Little Cicero Creek	*E.coli*
Pipe Creek-Kirkthawenund Camp	5120201050090	Pipe Creek	*E.coli*, PCBs
Duck Creek-Long Branch	5120201060060	Long Branch	*E.coli*
Little Cicero Creek-Teter Branch	5120201080080	N/A	N/A
Stowers Ditch-Stoker Ditch	5120110010020	N/A	N/A
White River-Sugar Run	5120201070020	Sugar Run	*E.coli*
		White River	*E.coli*, IBC
Morse Reservoir-Bear Slide Creek	5120201080110	Morse Reservoir	Algae, PCBs, and Taste

Watershed Name	14 Digit HUC	Impaired Water Body	Type of Impairments
Hinkle Creek-Jones Ditch	5120201080100	N/A	N/A
White River-Perkinsville	5120201040100	White River	*E.coli*, Cyanide, PCBs
White River-Dyers Creek	5120201070010	White River	*E.coli*, PCBs
Eagle Creek-Dixon Branch	5120201120010	Dixon Branch	*E.coli*
		Eagle Creek	*E.coli*
Eagle Creek-Finley Creek	5120201120030	Finley Creek	*E.coli*
White River-Mallory Granger Ditch	5120201070030	White River	*E.coli*, IBC
		Ingerman Ditch	*E.coli*
		Mallory Grainger	*E.coli*
Stony Creek-William Lock Ditch	5120201070050	Stony Creek	*E.coli*, IBC, PCBs
		William Lock Ditch	*E.coli*
Eagle Creek-Kreager Ditch	5120201120020	Kreager Ditch	*E.coli*
Little Eagle Branch-Headwaters	5120201120060	Little Eagle Creek	*E.coli*
Cicero Creek-Sly Run	5120201080120	Booth Drain	*E.coli*
		Sly Run	*E.coli*
		Sly Run East	*E.coli*
		Sly Run West	*E.coli*
Cool Creek-Grassy Branch/Little Cool Creek	5120201090030	Cool Creek	*E.coli*
		Grassy Branch	*E.coli*
Stony Creek-William Lehr Ditch	5120201070060	William Lehr	*E.coli*
Stony Creek-North Trib (Noblesville)	5120201070070	Stony Creek	*E.coli*, IBC
Mud Creek-Headwaters	5120201110030	N/A	N/A
Little Eagle Branch-Woodruff Branch	5120201120070	Bear Creek	*E.coli*
		Little Eagle Creek	*E.coli*
		Woodruff Branch	*E.coli*
White River-Vestal Ditch/Michener Ditch	5120201090020	White River	*E.coli*, PCBs
Mud Creek-Sand Creek	5120201110040	N/A	N/A
Fall Creek-Pendleton to Lick Creek	5120201100090	Fall Creek	*E.coli*
White River-Shoemaker Ditch (Hamilton)	5120201090010	White River	*E.coli*, PCBs
		Shoemaker	*E.coli*
Williams Creek	5120201090060	N/A	N/A
Thorpe Creek (Geist Reservoir)	5120201100130	N/A	N/A
Eagle Creek-Long Branch/Irishman Run	5120201120080	N/A	N/A
White River-Carmel Creek	5120201090040	White River	*E.coli* and PCB
Lick Creek-Manifold/McFadden Ditches	5120201100110	Lick Creek	*E.coli*
Fall Creek-Flatfork Creek	5120201100120	N/A	N/A
Geist Reservoir-Bee Camp	5120201100150	Fall Creek	*E.coli*, PCBs
		Finley Creek	*E.coli*

Watershed Name	14 Digit HUC	Impaired Water Body	Type of Impairments
		Geist Reservoir	Algae, PCBs, and Taste
Crooked Creek (Marion)	5120201090070	N/A	N/A
White River-Haverstick Creek/Howland Ditch	5120201090050	White River	*E.coli*, PCBs

(IDEM, 2008)

With 29 watersheds containing at least one impaired waterway, the Co-Permittees have identified priority watersheds as those watersheds that have more than 1 stormwater related impairment (*E.coli*, IBC, Nutrients, Cyanide). PCBs are not considered to be a stormwater related impairment. The following subwatersheds have been identified as priority watersheds:

- Cox Ditch – Christy/Kirgin Ditch (05120201080010)
- Duck Creek – Lamberson Ditch (05120201060040)
- Geist Reservoir – Bee Camp (05120201100150)
- Morse Reservoir – Bear Slide Creek (05120201080110)
- Stony Creek – North Trib (05120201070070)
- Stony Creek – William Lock Ditch (05120201070050)
- White River – Mallory Grainger Ditch (05120201070030)
- White River - Perkinsville (05120201040100)
- White River – Sugar Run (051201070020)

4.2 UNITED STATES GEOLOGIC SURVEY (USGS) STUDIES

In 1991, the U.S. Geological Survey (USGS) began implementation of the National Water Quality Assessment (NAWQA) Program. The NAWQA program integrates the monitoring of surface and ground water quality with the study of aquatic ecosystems. The goals of the NAWQA program are to (1) describe current water quality conditions for a large part of the Nation's freshwater streams and aquifers, (2) describe how water quality is changing over time, and (3) improve our understanding of the primary natural and human factors affecting water quality. NAWQA program studies are conducted within areas called study units.

The White River Basin is a NAWQA study area. A NAWQA water quality assessment was completed for this basin between 1992 and 1996, which included water quality monitoring from 10 sites in the White River Basin. The study found that water quality issues in the White River basin are related primarily to agriculture, the dominant land use, and, on a more localized scale, to urbanization. Key water quality issues for the basin were considered to be related to the effects of:

- Nutrients transported by agricultural runoff and groundwater recharge.
- Pesticides transported by agricultural runoff and groundwater recharge.
- Soil erosion from agricultural areas. Transport of pesticides and nutrients that adhere to sediments also can affect water quality in streams.
- Urban storm runoff and combined-sewer overflows.

- Diverse sources of chemical compounds on regional ground-water quality (sources include landfills, hazardous-material spills, leaking underground storage tanks, and septic systems).

The White River NAWQA reported that most of the nitrogen (nitrate) input into the White River Basin comes from nonpoint sources, primarily from application of commercial fertilizers. Other sources of nitrate include, farm animal manure and effluent from sewage treatment plants. Tile drains have a major influence on nitrate concentrations in many streams in the basin.

In addition, the report noted that herbicides applied to corn and soybeans dominate pesticide use in the White River Basin. Triazine (primarily atrazine and cyanazine) and acetanilide (acetochlor, alachlor, and metolachlor) compounds are the most commonly used herbicides. Herbicide use on corn accounts for about 70% of the total agricultural use of pesticides in the basin. About 96% of the total agricultural pesticide use is herbicide and insecticide use on corn and soybeans.

Urban areas in the White River Basin were identified as sources of organic compounds, trace elements (including heavy metals), and nutrients. High concentrations of phosphorus and ammonia are caused by the discharge of treated sewage, urban runoff, and other discharges. High concentrations of phosphorus can cause undesirable aquatic plant growth, whereas high concentrations of ammonia can kill fish.

- Since the USGS NAWQA study concluded that water quality issues in the White River basin are related primarily to agriculture, and agricultural land uses account for approximately 79% of land uses within the Co-Permittees' MS4 Area, the Co-Permittees will consider agricultural areas within the MS4 Area as a priority and will work with the NRCS to encourage agricultural BMPs to local agricultural producers within the MS4 Area.

4.3 STREAM REACH CHARACTERIZATION EVALUATION REPORT

According to Indiana's Combined Sewer Overflow (CSO) Strategy, which was adopted by the IDEM in May 1996, all CSO communities within the State were required to address the ninth minimum control measure (monitoring to effectively characterize CSO impacts) by conducting a Stream Reach Characterization and Evaluation study. The City of Noblesville's Stream Reach Characterization and Evaluation Report (SRCER) was completed and submitted to the IDEM in June 2001. The study characterized the impacts of the City's 10 CSOs upon 3 water bodies: The West Fork White River, Wilson's Ditch, and Stony Creek. All of these waterbodies are identified as Co-Permittee Receiving Waters.

Grab samples were collected during both dry and wet weather conditions from a total of 7 sites on the West Fork White River, Wilson's Ditch, Stony Creek, and Cicero Creek. Samples were collected from Cicero Creek to account for the creek's discharge volume and pollutant loadings within the CSO area. Water quality parameters evaluated by this study included: dissolved oxygen (D.O.), temperature, pH, total suspended solids (TSS), ammonia, *E.coli* bacteria, and 5-day carbonaceous biochemical oxygen demand (CBOD5).

Noblesville's SRCER determined that over 91% of the total CSO discharge volume is discharged to the White River and only 8.5% of the total discharge volume is discharged to Wilson's Ditch/Stony Creek. Although CSOs discharges to Wilson's Ditch/Stony Creek were considered to be "minimal", the report suggests that "other significant pollution sources exist along Stony Creek". The SRCER also states that "Cicero Creek also contributed significant amount of pollutants to White River although there is no CSO discharge to the creek. Pollutant loadings must be coming from other point and non-point sources."

- In addition to the pollutants contributed by the City of Noblesville's CSOs, the City's SRCER documents "significant pollution" from upstream sources to the White River, Wilson's Ditch/Stony Creek, and Cicero Creek, all of which are receiving streams of the Copermittee's. The SRCER attributed these pollutants to other point and non-point sources of pollution, such as stormwater runoff. This report provides strong evidence that urban stormwater discharges are not the only cause of water quality pollution in Hamilton County.

4.4 LAKE AND RIVER ENHANCEMENT (LARE) PROGRAM

No LARE studies were identified that were relevant to Co-Permittees' MS4 Area.

4.5 CLEAN WATER ACT SECTION 319 GRANT STUDIES

Over the past few years Hamilton County has received several Section 319 grants to develop watershed management plans for County watersheds. Since 2005, IDEM has approved watershed plans for 4 Hamilton County Watersheds, Little Cicero Creek, Duck Creek, Stony Creek, and Cool Creek.

Duck Creek Water Quality Monitoring

In 2006 the Hamilton County SWCD was awarded a Section 319 study for the Duck Creek Watershed. The project was coordinated by Williams Creek Consulting, Inc. and involved the establishment of a Steering Committee, the analysis of existing water quality studies, and partnering with several other local partners to identify water quality problems and solutions specific to the Duck Creek Watershed.

In total the Duck Creek Watershed studied 6 14-digit HUC watersheds, of which 3 were located within portions of Hamilton County. Specifically these watersheds included Duck-Creek - Long Branch (05120201060060), Bear Creek – West Fork Bear Creek (0512020160050), and Duck Creek - Lamberson Ditch (05120201060040). Water quality issues of concern were identified through public participation, an evaluation of existing water quality studies, and through the collection of macroinvertebrate samples and habitat evaluations. Benthic macroinvertebrate samples and habitat evaluations were collected from 10 sites in the watershed. Six of the 10 sites were located within Hamilton County.

Based on data collected during the project it was determined that Total Suspended Solid (TSS) Water Quality Standards are being exceeded throughout the watershed, that *E.coli* counts are exceeding Water Quality Standards throughout the watershed, and that Nitrogen and Phosphorus concentrations are exceeding EPA recommended standards throughout the watershed.

In addition to a thorough assessment, the Duck Creek Study provided recommendations to address the pollutants impacting the watershed. **Table 4-2** details the recommendations as they pertain to the Co-Permittees' Stormwater Program.

Table 4-2
Duck Creek Watershed Study Recommendations

Recommended BMPs	BMP Benefits
• Increase conservation tillage and no till practices implementation throughout the watershed.	• Conservation tillage minimizes the transport of sediment and sediment bound pollutants from croplands.
• Increase buffer strips along waterways in the watershed.	• Buffer strips serve as sediment and pollutant filters while slowing the velocity of runoff from croplands.
• Exclude livestock from streams throughout the watershed.	• Exclusionary fencing minimizes bacteria and sediment loadings from livestock.
• Reduce the amount of fertilizer being applied to agricultural and residential lands. **The Co-Permittees have implemented a stormwater education programs as a component of their Stormwater Program.**	• Fertilizer education will help to reduce nutrient loadings in receiving waters.

Little Cicero Creek Water Quality Study

In 2005, the Hamilton County Surveyor's Office received a Section 319 grant to develop a watershed management plan for the Little Cicero Creek Watershed. The project was coordinated by JF New, and involved the establishment of a Steering Committee, the analysis of existing water quality studies, the collection of new water quality data, and partnering with several other local partners to identify water quality problems and solutions specific to the Little Cicero Creek Watershed.

The watershed study included Steering Committee and public meetings throughout the process, and water quality data collection consisted of collecting 2 base flow and 2 storm flow events as well as the collection of habitat data at a total of 8 sites in the Little Cicero Creek Watershed. Based on data collected during the project, it was determined that sediment

loadings are elevated throughout the watershed, *E.coli* loadings are elevated throughout the watershed, and nutrient loadings are elevated throughout the watershed.

In addition to a thorough assessment, the Little Cicero Creek Study provided recommendations to address the pollutants impacting the watershed. **Table 4-3** details the recommendations as they pertain to the Co-Permittees' Stormwater Program.

Table 4-3
Little Cicero Creek Watershed Study Recommendations

Recommended BMPs	BMP Benefits
• Increase conservation and no-till practice implementation throughout the watershed.	• Conservation tillage minimizes the transport of sediment and sediment bound pollutants from croplands.
• Increase buffer strips along waterways in the watershed.	• Buffer strips serve as sediment and pollutant filters while slowing the velocity of runoff from croplands.
• Develop a recognition program for developers using effective sediment control BMPs.	• Recognizing strong erosion and sediment control programs should provide developers with an incentive to improve their own erosion and sediment control practices.
• Develop a cost-share program for the installation of water quality BMPs.	• Cost share program would provide developers with an incentive to install creative water quality BMPs.

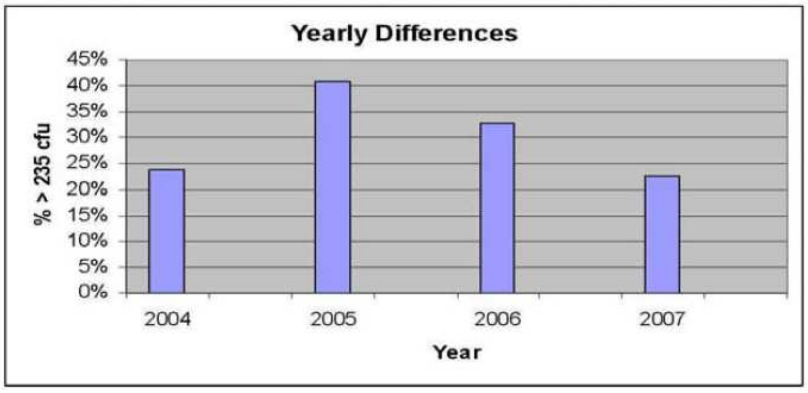
A summary of the Stony Creek Watershed Study is provided in **Section 4.8** of this document and a summary of the Cool Creek Watershed Study is provided in **Section 4.10** of this document.

- Based on the data collected in these 2 Section 319 studies the following subwatersheds have been identified as priorities for the Co-Permittees' Stormwater Program:
  - Bear Creek – West Fork Bear Creek (0512020160050)
  - Duck Creek - Lamberson Ditch (05120201060040)
  - Duck Creek - Long Branch (05120201060060)
  - Little Cicero Creek - Bennett Ditch/Taylor Creek (05120201080090)
  - Little Cicero Creek - Teeter Branch (05120201080080)

4.6 HEALTH DEPARTMENT STUDIES

The Hamilton County Health Department conducts an annual Recreational Water Quality Sampling Program. The objective of the program is to monitor and evaluate *E.coli* levels in Hamilton County's waterways where the public is most likely to come into contact with surface

water. Samples are collected during the recreational season (April through October). These samples have been collected since 2005. The table below identifies the percent of water quality samples that have exceeded the grab sampling Water Quality Standard for *E.coli* of 235 Colony Forming Units/100ml of water.



According to the Health Department's study, Site 10 (Fall Creek at Geist Park), Site 12 (Cool Creek at Cool Creek Park), Site 15, (Thomson Drain at Asa Bales Park), and Site 16 (Cicero Creek at Morse Reservoir Beach) most consistently violate the State Water Quality Standard for *E.coli.*

4.7 INDIANA UNIVERSITY-PURDUE UNIVERSITY AT INDIANAPOLIS (IUPUI) STUDY

The Center for Earth and Environmental Science (CEES) at IUPUI and the Central Indiana Water Resources Partnership worked on a study entitled *Water Quality and Nutrient Cycling in Three Indiana Watersheds and Their Reservoirs*. While this project is being conducted completely independent of the Co-Permittees' Stormwater Phase II Program, the results may be relevant and useful in future evaluations of the Co-Permittees' SWQMP. According to the CEES website, the approach of the study has been to undertake an extensive research program to characterize the sediment, nutrient, and water dynamics in the reservoirs and gain an understanding of the sources, fluxes, and timing of chemical inputs from the watersheds. This research is still ongoing.

4.8 STONY CREEK WATERSHED STUDY

In November of 2002, the Hamilton County Surveyor's Office hired Christopher B. Burke Engineering, Ltd. (CBBEL) to conduct a study of the Stony Creek Watershed in Hamilton County, Indiana. The project included both water quality and water quantity studies, of which CBBEL subcontracted water quality monitoring tasks to Dr. Claude Baker of Indiana University. Dr. Baker, of the New Albany campus, and his students conducted water quality tasks, including chemical monitoring, habitat assessments, and bio-monitoring at 9 sites within the Stony Creek watershed during the months of May, June, and October of 2003.

Stony Creek Water Quality Monitoring

Water quality samples were collected at 9 project sites to characterize high flow, base flow, and low flow conditions. Water quality parameters evaluated by the study included: water and air temperature, dissolved oxygen, pH, alkalinity, turbidity, conductivity, total dissolved solids, nitrate, nitrite, ammonia-nitrogen, total nitrogen, ortho-phosphate, and fecal coliform bacteria.

Monitoring results identified several pollutants at concentrations of concern in the Stony Creek watershed. Fifteen of the thirty samples collected were above 200 fecal coliform colonies per each 100ml sample, which may pose threats to public health via recreational contact. In addition, results identified elevated concentrations of phosphate and nitrate. These nutrients have been known to contribute to the growth of noxious algae and aquatic weeds in aquatic environments. Elevated turbidity values and visual observations also identified erosion and sedimentation problems at several locations in the watershed.

The Stony Creek Watershed Study suggests that pollutants within the watershed may originate from the following:

- livestock with direct access to the stream
- overland flow (runoff) of manure applied to agricultural fields as fertilizer
- failed on-site septic systems or illegal septic tank connections to tile drains
- agricultural tile drainage systems
- erosion and sedimentation from constructions sites
- erosion and scouring around bridges
- runoff from impervious surfaces in urbanized areas

Stony Creek Habitat Assessments

Habitat assessments conducted at each of the 9 sampling sites were performed using 2 analyses methods: EPA's Habitat Assessment from the Rapid Bioassessment Protocols (RBP) and the Ohio EPA's Qualitative Habitat Evaluation Index (QHEI).

Both methods of assessing habitat resulted in a conclusion that Stony Creek's habitat was "poor" at all sites. Dredging, channelization, and the refilling of natural pools by sediments and muck have degraded the stream and riparian habitat of Stony Creek. The creek has a lack of exposed substrates that organisms use as habitat and water willow and aquatic emergent plants have choked existing riffle areas.

Stony Creek Biomonitoring

Macroinvertebrates were collected at each of the 9 sampling sites and evaluated by utilizing the EPA's Rapid Bioassessment Protocol (RBP). The RBP focuses on macroinvertebrates in riffle/run habitats. Samples were collected at each station utilizing a traveling kick net method.

Macroinvertebrate assessments completed for this project rated Stony Creek's biotic communities as "moderately" impaired. The study characterizes Stony Creek as having low numbers of individual species, low taxa richness, and an elevated population of organisms tolerant to pollution The report also states that in healthy streams, large numbers of schooling minnows (shiners, chubs, etc) are normally expected to be observed; however, not a single school of minnows was observed at any sampling site during this study.

In addition to a thorough assessment, Dr. Baker and his students provided recommendations to address the pollutants impacting Stony Creek. **Table 4-4** details the recommendations as they pertain to the Co-Permittees' Stormwater Phase II permit.

Table 4-4
Stony Creek Watershed Study Recommendations

Recommended BMPs	BMP Benefits
• Exclusionary fencing of cattle from streams and streambanks. • Restoration of eroded streambanks and riparian areas through vegetative practices such as grass plantings, tree plantings and willow cuttings.	• Exclusionary fencing minimizes bacteria and sediment loadings from livestock. • Vegetative plantings minimize streambank erosion while serving as sediment and pollutant filters. Vegetation also slows the velocity of runoff from upland areas. • Vegetative practices increase stream shading resulting in increased oxygen concentrations.
• Implementation of manure management techniques.	• Manure management minimizes bacteria and nutrient loading from manure-applied croplands and pasturelands.
• Implementation of conservation tillage, nutrient management and conservation buffers upon croplands.	• Conservation tillage minimizes the transport of sediment and sediment bound pollutants from croplands. • Nutrient management minimizes the amount of nutrients applied reducing the risk of over application and subsequent runoff. • Buffer strips serve as sediment and pollutant filters while slowing the velocity of runoff from croplands.
• Utilization of erosion and sediment control (ESC) practices upon construction sites. **This has been completed by the Co-Permittees.**	• ESC practices minimize erosion and sedimentation that originates from developing and/or redeveloping areas.
• Utilization of Post-Construction BMPs such as retention and detention basins upon developing and re-developing areas. **This has been completed by the Co-Permittees.**	• Retention and detention ponds, as well as other Post-Construction BMPs, provide for the settling out of sediment and pollutants prior to discharge. • Post-Construction BMPs also minimize runoff volumes and velocities minimizing upland and streambank erosion.
• Maintenance of conveyances, especially around existing bridges.	• Conveyance maintenance minimizes erosion and scouring of streambanks improving habitat.
• Utilization of instream carpentry techniques such as artificial riffles and low head stone weirs.	• Artificial riffles and low head stone weirs direct water away form streambanks and increase the oxygen concentrations of the water column.
• Maintenance of stream channels by removing muck and some large woody debris (LWD).	• LWD provides beneficial fish habitat, however, much of the LWD is buried in silt and muck. The removal of these materials increases instream habitat.

Recommended BMPs	BMP Benefits
• Implementation of comprehensive rain garden programs on commercial and residential properties.	• Minimizes runoff volumes of stormwater limiting erosion and pollutant loading.

In 2006, the Hamilton County Surveyor's Office received a grant from the IDEM to update the existing Stony Creek Watershed Study to meet the IDEMs Watershed Management Plan Checklist. According to the updated study, which was completed in early 2007, key water quality concerns in the watershed were a lack of stream side buffers, failing septic systems, improper disposal of wastes, rapid urbanization, and fertilizer and pesticide application to residential and agricultural lands. Water quality goals and recommendations in the study were consistent with goals in the original study and therefore have not been summarized in this report.

- Based on data collected as a part of this study the following subwatersheds have been identified as priorities as a part of the Co-Permittees' Stormwater Program:
  - Stony Creek – North Trib (05120201070070)
  - Stony Creek – William Lock Ditch (05120201070050)

4.9 MUD CREEK WATERSHED STUDY

In November of 2002, the Hamilton County Surveyor's Office hired Christopher B. Burke Engineering, Ltd. (CBBEL) to conduct a study of the Mud Creek Watershed in Hamilton County, Indiana. The project included both water quality and water quantity studies, of which CBBEL subcontracted water quality monitoring tasks to Dr. Claude Baker of Indiana University. Dr. Baker, of the New Albany Campus, and his students conducted water quality tasks, including chemical monitoring, habitat assessments, and bio-monitoring at 8 sites within the Mud Creek watershed, of which 6 of the sites were located on Mud Creek and 2 sites were located on Sand Creek, a major tributary to Mud Creek. Monitoring was conducted during the months of May, June, and October of 2003.

Mud Creek Water Quality Monitoring

Water quality samples were collected at 8 sampling sites to characterize high flow, base flow, and low flow conditions. Water quality parameters evaluated by the study included: water and air temperature, dissolved oxygen, pH, alkalinity, turbidity, conductivity, total dissolved solids, nitrate, nitrite, ammonia-nitrogen, total nitrogen, ortho-phosphate, and fecal coliform bacteria.

Monitoring results identified several pollutants at concentrations of concern in the Mud Creek watershed. Thirteen of the 24 samples collected were above 200 fecal coliform colonies per each100ml sample, which may pose threats to public health via recreational contact. The Sand Creek site downstream of the Verizon Entertainment Complex, located in Hamilton County portion of the watershed, exceeded 200 colonies per 100ml sample during all sampling events. This site also had the highest coliform value of 5,696 colonies per 100ml and the lowest dissolved oxygen concentrations on average. In addition, results identified elevated

concentrations of phosphate and nitrate. These nutrients have been known to contribute to the growth of noxious algae and aquatic weeds in aquatic environments. Elevated turbidity values and visual observations also identified erosion and sedimentation problems at several locations in the watershed immediately following storm events. Results did indicate, however, that the stream has sufficient oxygen levels and pH values to support aquatic life.

The Mud Creek Watershed Study suggests that pollutants within the watershed may originate from the following:

- erosion and sedimentation from constructions sites
- eroding streambanks
- runoff from impervious surfaces
- rapid urbanization of the watershed
- failed on-site septic systems or illegal septic tank connections to tile drains
- agricultural tile drainage systems
- runoff from agricultural lands

Mud Creek Habitat Assessment

Habitat assessments conducted at each of the 8 sampling sites were performed using 2 analyses methods: EPA's Habitat Assessment from the Rapid Bioassessment Protocols (RBP) and the Ohio EPA's Qualitative Habitat Evaluation Index (QHEI).

The RBP method found all sites to be of sufficient condition to support aquatic life, while the QHEI method identified most sites as being "moderately" impaired. Both methods found that Mud Creek has numerous natural and artificial riffles that aerate the stream and provide good macroinvertebrate habitat. However, numerous stretches of streambank along Mud Creek were identified as experiencing severe erosion. In addition, the Sand Creek site at the Verizon Complex was determined to be "limiting" for aquatic life due to previous channelization, low dissolved oxygen concentrations and elevated bacteria levels. The report cites rapid urbanization on adjacent lands and upstream agricultural activities as the sources of impairment at this site.

Mud Creek Biomonitoring

Macroinvertebrates were collected at each of the 8 sites utilizing the EPA's Rapid Bioassessment Protocol (RBP). The RBP focuses on macroinvertebrates in the riffle/run habitat. Samples were collected at each of the 8 sites utilizing a traveling-kick net method.

The macroinvertebrate assessment revealed that Mud Creek is "moderately" impaired due to rapid urbanization of the watershed. In addition, the Sand Creek site, downstream of the Verizon Entertainment Complex, was considered "severely" impaired due to the rapid development occurring on the adjacent upland areas and runoff and tile discharges from upstream agricultural lands.

In addition to a thorough assessment, Dr. Baker and his students provided recommendations to address the pollutants impacting Mud Creek. **Table 4-5** details the recommendations as they pertain to the Co-Permittees' Storm Water Quality Management Plan.

Table 4-5
Mud Creek Watershed Study Recommendations

Recommended BMPs	BMP Benefits
• Restoration of eroded streambanks and riparian areas through vegetative practices such as grass plantings, tree plantings and willow cuttings.	• Vegetative plantings minimize streambank erosion while serving as sediment and pollutant filters and slowing the velocity of runoff from upland areas. • Vegetative practices increase stream shading resulting in increased oxygen concentrations.
• Implementation of conservation tillage, nutrient management and conservation buffers upon croplands.	• Conservation tillage minimizes the transport of sediment and sediment bound pollutants from croplands. • Nutrient management minimizes the amount of nutrients applied reducing the risk of over application and subsequent runoff. • Buffer strips serve as sediment and pollutant filters while slowing the velocity of runoff from croplands.
• Utilization and enforcement of erosion and sediment control (ESC) practices upon construction sites. **This has been completed by the Co-Permittees.**	• ESC practices minimize erosion and sedimentation that originates from developing and/or redeveloping areas area.
• Utilization of Post-Construction BMPs such as retention and detention basins upon developing and re-developing areas. **This has been completed by the Co-Permittees.**	• Retention and detention ponds, as well as other Post-Construction BMPs, provide for the settling out of sediment and pollutants prior to discharge. • Post-Construction BMPs also minimize runoff volumes and velocities minimizing upland and streambank erosion.
• Utilization of comprehensive rain gardens, grassy swales and dry retention ponds on commercial and residential properties.	• These measures minimize runoff volumes of stormwater, increasing infiltration and therefore limiting erosion and pollutant loading.

- Based on data collected as a part of this study the following subwatersheds have been identified as priorities as a part of the Co-Permittees' Stormwater Program:
  - Mud Creek - Headwaters (5120201110030)
  - Mud Creek - Sand Creek (5120201110040)

4.10 COOL CREEK WATERSHED STUDY

In 2002, the Hamilton County Surveyor's Office, in cooperation with the City of Carmel and the Town of Westfield, contracted with Clark Dietz, Inc. to develop a watershed management plan for the Cool Creek watershed. The planning process involved a water quality study. The information below details the specifics of the water quality study, the study results, as well as recommendations to address the identified water quality issues associated with Cool Creek's stormwater discharges.

Water Quality Monitoring

During the spring and fall of 2002, water quality samples were collected during 2 dry weather events (06-21-02 and 09-09-02) and 2 wet weather events (03-25-02 and 8-19-02). The wetweather events consisted of .7 inches of rainfall and 2.9 inches respectively.

Grab sampling was conducted at 3 locations within the watershed: the 186th Street bridge, the 146th Street bridge and the 116th Street Bridge. The parameters of interest included biological oxygen demand (BOD), chemical oxygen demand (COD), total Kjelhdahl nitrogen (TKN), Nitrate (NO3), Ammonia (NH4), organic nitrogen, dissolved phosphorus, suspended solids, dissolved solids, E. coli, fecal streptococcus, chromium hex, phenol, copper, nickel and zinc. Test America, Inc. performed the necessary laboratory analysis in accordance with EPA methods.

Study Results

Utilizing a variety of reference documents to interpret the water quality data, Clark Dietz, Inc. drew the following conclusions.

- Copper, nickel, chromium and zinc were all found above detection limits. However, only nickel and chromium concentrations were above the national average associated with urban runoff. The report sited roofing materials, piping and vehicles as the primary sources of these metals.
- The average concentration of nutrients (nitrogen and phosphorus) at all 3 monitoring sites and during both storm events were somewhat higher than the national average associated with urban runoff.
- Suspended solids concentrations were high during wet weather, especially during the atypical 8-19-02 storm. Potential sediment sources mentioned include erosion from construction sites, eroding streambanks and runoff from agricultural lands in the upper reaches of the watershed.
- 100% of the wetweather samples and 50% of the dry-weather samples exceeded Indiana's E. coli standard for recreational contact. Potential sources mentioned include failing or faulty septic systems, illicit sanitary stormsewer connections and the runoff of pet waste.

Recommendations

In addition to a thorough assessment, Clark Dietz, Inc. provided recommendations to address the pollutants impacting Cool Creek. **Table 4-6** details the recommendations as they pertain to Co-Permittees' Stormwater Program.

Table 4-6
Cool Creek Watershed Study Recommendations

Recommended BMPs	BMP Benefits
• Implementation of conservation tillage, nutrient management and conservation buffers upon croplands in the upper reaches of the Cool Creek watershed.	• Conservation tillage minimizes the transport of sediment and sediment bound pollutants from croplands • Nutrient management minimizes the amount of nutrients applied reducing the risk of over application and subsequent runoff • Buffer strips serve as sediment and pollutant filters while slowing the velocity of runoff from croplands
• Restoration of eroded streambanks and riparian areas through vegetative practices such as grass plantings, tree plantings and willow cuttings	• Vegetative plantings minimize streambank erosion while serving as sediment and pollutant filters and slowing the velocity of runoff from upland areas • Vegetative practices increase stream shading resulting in increased oxygen concentrations
• Development and enforcement of a comprehensive erosion and sediment control (ESC) ordinance for construction sites. **This has been completed by the Co-Permittees.**	• Properly installed and maintained ESC practices minimize erosion and sedimentation that originate from developing and/or redeveloping areas
Continued enforcement and enhancement of existing stormwater detention standards that require the utilization of retention and detention basins upon developing and re-developing areas. The Co-Permittees continue to enforced detention requirements.	• Retention and detention ponds, as well as other Post-Construction BMPs, provide for the settling out of sediment and pollutants prior to discharge • Post-Construction BMPs also minimize runoff volumes and velocities minimizing upland and streambank erosion
• Development of a consistent "floodplain fill" ordinance between Carmel, Westfield and Hamilton County that prohibits filling of the 100-year floodplain. **The Co-Permittees have adopted a policy prohibiting filling in the floodplain**.	• Consistent floodplain regulations prohibiting fill would help alleviate flooding and the associated water quality impacts

Recommended BMPs	BMP Benefits
• Identification of faulty septic systems and illicit sanitary storm sewer connections.	• Faulty septic systems and illicit connections are believed to be significant contributors of bacteria to the Cool Creek watershed.
• Implementation of a public stormwater education program concerning issues such as: proper operation and maintenance of septic systems, pet waste management, lawn and garden management and streambank and riparian corridor maintenance. **The Co-Permittees have implemented a stormwater education programs as a component of their Stormwater Program.**	• Numerous members of the public do not fully understand how their daily activities can impact stormwater quality and could benefit from such a program.

As mention in Section 4.6, in 2004 Hamilton County applied for a grant to update the existing Cool Creek Watershed Study to meet IDEM's Watershed Management Plan Checklist. According to the study, the Cool Creek Watershed is rapidly urbanizing and 50-60% of the watershed is currently considered urban. Among the key water quality problems identified in the study were streambank erosion, sedimentation, elevated nutrients concentrations, elevated bacteria concentrations, and loss of ecological diversity in the watershed. In addition to water quality, flooding was also identified as a key problem in the watershed. Goals and recommendations in the watershed plan were consistent with those established in the original study and therefore have not been summarized in this report.

- Based on data collected as a part of this study the following subwatersheds have been identified as priorities as a part of the Co-Permittees' Stormwater Program:
  - Cool Creek – Grassy Branch/Little Cool Creek (05120201090030)

4.11 USFW SURVEY OF FISH COMMUNITIES AND HABITAT QUALITY IN TRIBUTARIES TO THE UPPER RIVER

In 2002, the United States Fish and Wildlife Service (USFW), at the direction of the Indiana Department of Natural Resources (IDNR), conducted a study of the West Fork White River from Muncie, Indiana to Indianapolis, Indiana. The study was conducted as a result of the 1999 fish kill that resulted in the death of more than 180 tons of fish, aquatic organisms and riparian wildlife along a 50 mile stretch of the White River from the City of Anderson, Indiana through downtown Indianapolis, Indiana.

Study Design

The study included fish sampling, habitat assessments and water quality sampling. All primary tributary streams draining the West Fork White River within the fish kill zone were included in the study. In all, 77 sites were chosen for study, including several Co-Permittee MS4 Area receiving waters, such as Carmel Creek, Cicero Creek, Cool Creek, Crooked Creek, Little Cool Creek, Mud Creek, Stony Creek, and Williams Creek.

Fish community sampling occurred between July and September of 2002. The entire length and width of each site was electrofished with either a backpack unit or a single tow-barge unit. The Index of Biotic Integrity (IBI) was utilized to score each site based upon the number and species of fish collected. Habitat analyses were conducted the same day as fish sampling utilizing the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA. Water quality parameters were measured twice during the study utilizing a Hydrolab datasonde capable of measuring temperature, dissolved oxygen, specific conductivity, pH, oxidation-reduction potential, turbidity, salinity, nitrate and ammonia. Water quality parameters were measured in conjunction with the first fish sampling event and then again in October of 2002.

Study Results

A total of 51 fish species comprised of 15,404 individuals were collected during the study. IBI scores for the different sites resulted in the following classifications: 0% excellent, 6.6% good, 27.6% fair, 55.3% poor, and 10.5% very poor. The sites with the lowest IBI scores were primarily in the rural areas of northeast Hamilton County, Madison County and northwest Delaware County. Cicero Creek in Hamilton County had the highest IBI score of 50, just below the Sheridan Avenue bridge.

QHEI scores ranged from 30 to 90. Williams Creek, Cicero Creek, Carmel Creek, and Crooked Creek had the highest QHEI scores. Cool Creek, Lily Creek, Killbuck Creek, Little Killbuck Creek, Pipe Creek and Stony Creek had the poorest QHEI scores, all scoring less than 35. The study cites channelization, removal of riparian corridors, sedimentation, and the loss of instream cover as the primary reasons for the poor habitat conditions within these streams.

Stream segments influenced by pollutant loadings had increased values of salinity, specific conductance, and total dissolved solids. Bear Creek, Duck Creek, Little Cool Creek, Pipe Creek, and Stony Creek had specific conductance values greater than 1,000 uS/mL and total dissolved solids greater than 600.

Nutrient enrichment findings varied greatly between rural/agricultural areas and residential/urban areas. Nitrate levels ranged from .61 to 37.46 mg/L during October 2002 while ammonia levels ranged from 0.1 to 3.2 mg/L. Nitrate values greater than 10 mg/L and ammonia values greater than .2 mg/L are considered toxic to aquatic life. Therefore, baseline ammonia values collected during the study suggest that 80.3% of the stream reaches sampled were acutely toxic to aquatic life. The study concludes that, assuming October ammonia levels resemble baseline conditions and that ammonia levels escalate during the spring and summer, almost all stream segments would be chronically toxic to aquatic life.

Conclusions

The findings of this study indicate that sites with the lowest IBI scores were primarily in the rural areas located in the northeast portion of the Co-Permittees' MS4 Area. However, some receiving waters within the MS4 Area, including Cool Creek and Stony Creek, had the poorest QHEI scores due to channelization, removal of riparian corridors, sedimentation, and the loss of instream cover. In addition, Little Cool Creek and Stony Creek were documented to have elevated concentrations of stormwater related pollutants.

- Based on the findings of this study, the following subwatersheds will be priorities for the Co-Permittees' Stormwater Program:

  - Cool Creek – Grassy Branch/Little Cool Creek (05120201090030)
  - Stony Creek – William Lock Ditch (05120201070050)
  - Stony Creek-North Tributary (05120201070070)

4.12 SUMMARY OF EXISTING WATER QUALITY DATA EVALUATIONS

As discussed in the above sections, existing water quality data and studies related to the Co-Permittees' MS4 Area receiving streams have identified multiple instances of stormwater related pollutants in the Co-Permittees' MS4 Area receiving streams. Based upon the data evaluated for this report, the following subwatersheds are considered priorities for the Co-Permittees' Stormwater Program:

- Bear Creek – West Fork Bear Creek (0512020160050)
- Cool Creek – Grassy Branch/Little Cool Creek (05120201090030)
- Cox Ditch – Christy/Kirgin Ditch (05120201080010)
- Duck Creek – Lamberson Ditch (05120201060040)
- Duck- Creek - Long Branch (05120201060060)
- Geist Reservoir – Bee Camp (05120201100150)
- Little Cicero Creek - Bennett Ditch/Taylor Creek (05120201080090)
- Little Cicero Creek - Teeter Branch (05120201080080)
- Morse Reservoir – Bear Slide Creek (05120201080110)
- Stony Creek – North Trib (05120201070070)
- Stony Creek – William Lehr Ditch (05120201070070)
- Stony Creek – William Lock Ditch (05120201070050)
- White River – Mallory Grainger Ditch (05120201070030)
- White River - Perkinsville (05120201040100)
- White River – Sugar Run (051201070020)

As water quality data and information has been updated and the number of watersheds impacting the Co-Permittees' MS4 Area has changed, so to have the listing of the Co-Permittees' priority watersheds. As additional changes and updates to water quality data are made it is likely that the Co-Permittees' priority watersheds will continue to change as well. It is important to note that while priority watersheds are given consideration during the

implementation of the Co-Permittees' Stormwater Program they are only 1 of many tools utilized to make planning and implementation considerations.

5.0 IDENTIFICATION AND ASSESSMENT OF EXISTING BMPs

Rule 13 requires the assessment of structural and nonstructural stormwater Best Management Practices (BMPs) and locations. The following discussion provides an inventory of BMPs identified for the Co-Permittees. Structural and non-structural BMPs are identified and discussed according to each of the 6 required Minimum Control Measures (MCMs).

5.1 ASSESSMENT OF EXISTING PUBLIC EDUCATION AND OUTREACH BMPs

Compliance with this MCM requires MS4s to demonstrate that residents, visitors, public service employees, commercial and industrial facilities, and construction site personnel within the MS4 are educated about the impacts of polluted stormwater runoff on MS4 Area receiving streams.

Existing Public Education and Outreach programs and activities performed by the Co-Permittees include but are not limited to the following:

Hamilton County Phase II Public Education Committee
The Hamilton County Phase II communities of Hamilton County, City of Carmel, Town of Cicero, City of Noblesville, Town of Westfield (now City), and the Town of Arcadia have developed a partnership called the Hamilton County Phase II Public Education Steering Committee. The Committee's purpose is to develop and implement Public Education and Outreach and Public Participation and Involvement programs and activities throughout Hamilton County that are consistent and complimentary in nature. The Steering Committee has met regularly throughout the permit term. Among other things the Committee has distributed educational brochures at numerous local events such as the County Fair, they have also developed Public Service Announcements (PSAs) for display at local theaters, distributed temporary tattoos, and purchased tributary signage.

Public Service Announcements
As part of the Public Education Committee's efforts to increase stormwater awareness, Public Service Announcements (PSAs) were shown in 2 local theaters. In total the PSAs played more than 14,280 times on movie screens and in theater lobbies.

Public Meetings
In the spring of 2007 a stormwater workshop was held to educate builders and developers about erosion control. In February of 2007, the Hamilton County Surveyor spoke to more than 40 residents at the Carmel Golden K Kiwanis Club luncheon in Carmel, Indiana about the Phase II Stormwater Program. In addition, throughout the permit term the Phase II Education Committee has been active in promoting and coordinating the annual "Keep it Clean" Stormwater Workshop.

Stormwater Brochures and Handouts
The Hamilton County Phase II Public Education Steering Committee has developed and distributed stormwater brochures designed to educate residents, visitors, public service employees, commercial and industrial facilities, and construction site personnel about the

impacts polluted stormwater runoff can have on water quality and the ways in which each constituency can minimize their impacts on stormwater quality. Among other things, the brochures include targeted outreach information on erosion and sediment control practices, illicit connections to the storm sewer system, improperly functioning septic systems, Household Hazardous Waste services, and Report-A-Polluter Programs. Brochures have been disseminated via mass mailings, at local places of business, at City, Town, and County offices, and at various local events. In 2007, 1,000 4x6" post-card sized flyers were distributed to the Hamilton County Humane Society for distribution with new pet adoptions. The Health Department sent approximately 143 septic information packets to those scheduling soils appointments for both new construction and repair jobs and approximately 100 maintenance letters to those who installed systems 3-4 years ago.

Newsletter Articles/Mass Media

The Hamilton County Soil and Water Conservation District (SWCD) and the Hamilton County Parks, publish and disseminate quarterly newsletters entitled *Town & Country* and the *Chatterbox*. The *Town and Country* is received by over 2,000 people and the *Chatterbox* is received by over 7,000. These newsletters include a variety of information on agricultural programs, conservation practices, and erosion and sediment control practices as well as stormwater runoff and pollution prevention information. These newsletter's include articles that discuss various stormwater topics such as, erosion and sediment control measures, agricultural issues related to stormwater quality, opportunities for citizens to get involved with stormwater events such as community clean up events and storm drain marking events, and other relevant information designed to enhance the urban and rural community's understanding of stormwater issues. The Hamilton County Public Education Steering Committee has provided information for these articles.

Stormwater Website

The Co-Permittees have developed individual stormwater websites. The County website has continued to be updated to better inform the residents, public service employees, commercial and industrial facilities, and construction site personnel about the impacts polluted stormwater runoff have on water quality and the ways in which each constituency can minimize their impacts on stormwater quality. The County website (www.co.hamilton.in.us/cleanwater) provides dates, times, and sponsors of stormwater related events such as workshops, clean-up events, and public meetings. The County website also includes copies of the Co-Permittees SWQMP, stormwater related ordinances, and other relevant information including meeting minutes. The County website includes a counter to track the number of "hits" the site receives**.** The Town of Cicero's website (www.ciceroin.com.org/streetutil.htm) also provides citizens with information on stormwater issues. The website provides information on construction standards, stormwater contact numbers, as well as links to the Hamilton County Stormwater Website, and a mechanism for reporting suspected pollution problems.

Household Hazardous Waste and Recycling Program Promotions

In order to educate community members on the importance of pollution prevention and recycling programs, the Hamilton County Phase II Public Education Steering Committee frequently advertises and promotes the activities and services of the Household Hazardous Waste (HHW) facility operated by the Hamilton County Solid Waste Management District. The Hamilton County HHW facility distributes a variety of educational brochures related to proper disposal of hazardous wastes and conducts a variety of educational programs for local schools and civic groups. The Hamilton County Emergency Management Agency, in conjunction with the Hamilton County Local Emergency Planning Committee (LEPC), has developed and is

distributing an educational brochure addressing the proper use, disposal, and recycling of common household products. The Hamilton County Health Department and the Hamilton County Household Hazardous Waste Program have ongoing public education programs involving pollution prevention and regularly promote Household Hazardous Waste services and educational programs for children as well as adults.

Soil and Water Conservation Activities
The SWCD includes articles in their quarterly newsletter, Town & Country, on some of the following issues, erosion and sediment control practices, agricultural issues related to stormwater quality, and opportunities for citizens to get involved with stormwater events such as community clean up and storm drain marking programs.

5.2 ASSESSMENT OF EXISTING PUBLIC PARTICIPATION AND INVOLVEMENT BMPs

Compliance with this MCM requires MS4s to demonstrate that opportunities were provided for stakeholders to participate in the development and implementation of the MS4's SWQMP.

Existing Public Participation and Involvement program performed by the Co-Permittees are as follows"

Soil and Water Conservation Activities (Backyard Conservation Program)
In 2007, the Hamilton County Soil and Water Conservation District organized a group of local stakeholders to develop and help implement a county-wide Backyard Conservation Program. The Backyard Conservation Committee's goal is to increase homeowner education about urban backyard conservation of natural resources, to provide guidelines about possible backyard conservation practices applicable to Hamilton County, and to encourage the implementation of these practices. From this committee, 3 subcommittees have been formed: the Outreach Committee, Administration and Finance Committee, and Technical Assistance Committee. Throughout 2007, meetings that were held include an informational meeting to involve local stakeholders, 2 Steering Committee meetings, and 6 subcommittee meetings. Members of the committee include residents, business owners, government agency staff, and engineers.

Storm Drain Marking
All newly installed cast iron inlets in unincorporated Hamilton County and along County Regulated Drains in new construction include the message "Dump No Waste, Drains to River." All such curb inlets are mapped on the County's GIS maps. The Hamilton County Highway Department also has similar requirements for new construction. The Town of Cicero has coordinated with local groups to conduct storm drain marking programs throughout the Town.

Clean-up Events
Hamilton County and the Town of Cicero have participated in the planning, funding, and/or implementation of numerous community clean-up events including the annual Hamilton County White River Clean-up, the Cool Creek Park Clean-up, and the annual Morse Waterway Association Clean-up. In 2007 alone, the White River Clean-up event resulted in the removal

of more than 10 tons of trash and debris from the White River.

Report-A-Polluter Program
In 2005 a Report-A-Polluter program was initiated, which provides citizens with an opportunity to notify local government officials of potential water quality concerns. An electronic form and emergency contact numbers are posted on the County Report-A-Polluter website. Six Report-A-Polluter forms were filled out and forwarded to the appropriate MS4 jurisdiction for follow-up during 2007. In addition, the Town of Cicero's website has a "Residents Speak Out" link which provides citizens with an opportunity to speak out on stormwater related issues.

5.3 ASSESSMENT OF EXISTING ILLICIT DISCHARGE DETECTION AND ELIMINATION BMPs

Compliance with this MCM requires MS4s to develop and implement a strategy to detect and eliminate illicit discharges to the MS4 conveyance system. To this end, Rule 13 requires communities to develop a storm sewer system map that identifies specified conveyances and outfalls, and requires dry weather screening of those outfalls.

Existing Illicit Discharge Detection and Elimination activities performed by the Co-Permittees are as follows:

Stormwater System Map
Hamilton County has completed mapping outfalls along Long Branch, Bear Slide Creek, and Thorpe Creek, all of unincorporated Clay Township as well as parts of unincorporated Washington Township. The County has mapped 100% of the known County Regulated Drains. In 2007 outfalls were mapped and screened in Clay Township. The County continues to map new County regulated drain conveyances from 'as-built' drawings supplied by the engineers/developers. The Town of Cicero has mapped and screened all of its stormwater conveyances and outfalls.

IDDE Ordinance and Plan
In September 2005, the County adopted an illicit discharge ordinance. The Town of Cicero has passed a resolution adopting the ordinance as well. Procedures for responding to Hazardous spills, the Report-A-Polluter, and conducting outfall mapping and screening are in place.

Report-A-Polluter Program
In 2005 a Report-A-Polluter program was initiated, which provides citizens with an opportunity to notify local government officials of potential water quality concerns. An electronic form and emergency contact numbers are posted on the County Report-A-Polluter website. Six Report-A-Polluter forms were filled out and forwarded to the appropriate MS4 jurisdiction for follow-up during 2007. In addition, the Town of Cicero's website has a "Residents Speak Out" link which provides citizens with an opportunity to speak out on stormwater related issues.

Annual IDDE Good housekeeping and Pollution Prevention Staff Training:
The Co-Permittees have conducted trainings for relevant staff on the hazards associated with illicit discharges and improper disposal of waste and pollution prevention via a Municipal Stormwater Training Video by Excal Corp and through attendance at an Illicit Discharge Detection and Elimination Training session based on the Center for Watershed Protection's Train-the-Trainer Program. The video by Excal Corp includes ways to manage activities to prevent substantial quantities of chemicals and water from entering the conveyance system. Topics also include proper storage and disposal of hazardous wastes, vegetative waste handling, fertilizer and pesticide application, and the function of implemented BMP's. Employees in the Surveyor's Office, Buildings and Grounds Department, Health Department, HHW Facility, Highway Department, Planning Department, and Emergency Management Agency have viewed a Municipal Stormwater Training Video and are keeping track of the training. The County Surveyor's Office plan reviewers and inspectors received over 340 hours of stormwater related training in 2007 alone. Emergency Management Agency staff attended the Hazardous Materials Conference in Greenwood in June, 2007.

5.4 ASSESSMENT OF EXISTING CONSTRUCTION SITE STORMWATER RUNOFF CONTROL BMPs

Compliance with this MCM requires MS4s to develop, implement, manage, and enforce an erosion and sediment control program for construction activities that disturb 1 or more acres of land within the MS4 Area.

Existing local Construction Site Runoff Control activities implemented by the Co-Permittees are as follows:

Erosion and Sediment Control Ordinance
In 2005 Hamilton County adopted a Construction Site Runoff Control and Post-Construction Site Runoff Control Ordinance. The County has also developed a Stormwater Technical Standards Manual. In December 2005 a public meeting was held in Hamilton County to explain these ordinances and standards to the development, engineering, and construction industry. The Town of Cicero has passed a resolution adopting the County's Construction and Post-Construction Site Runoff Control Ordinance and the Stormwater Technical Standards Manual.

Plan Review, Site Inspection, and Enforcement/Tracking Database
On January 1, 2006 the Hamilton County Surveyor's Office assumed Rule 5 plan review and enforcement for unincorporated areas of Hamilton County. In 2007, the Hamilton County Surveyor's Office reviewed over 51 plans for erosion control and made over 413 site visits. Hamilton County and the Town of Cicero submit construction activity reports to the Rule 13 Coordinator on a monthly basis.

Staff Training
The Co-Permittees is committed to ensuring that staff members receive adequate stormwater training. In 2007 plan reviewers and inspectors in the Surveyor's Office received a total of more than 340 hours of stormwater related training discussing erosion control and plan review

inspections. Plan reviewers and inspectors for the Town of Cicero also participate in annual training programs.

Procedure for Prioritizing Construction Activities
Prioritization for construction activities is based upon the size of the site as well as the presence of sensitive areas such soils, wetlands, threatened or endangered species habitat, outstanding waters, impaired waters, recreational waters, and surface drinking water sources.

QAQC of Program
The Hamilton County Stormwater Standards Steering Committee, which includes representatives from the City of Carmel, the Town of Cicero, the Town of Fishers, the City of Noblesville, the City of Westfield, and Hamilton County meets on a monthly basis to discuss Stormwater Program implementation throughout Hamilton County MS4s.

5.5 ASSESSMENT OF EXISTING POST-CONSTRUCTION SITE STORMWATER RUNOFF CONTROL BMPs

Compliance with this MCM requires MS4s to develop a program for managing Post-Construction Best Management Practices (BMPs) that will ensure adequate, long-term stormwater quality benefits in new development and redevelopment activities. Once construction is complete, Post-Construction practices specified by the MS4 must be implemented to ensure adequate stormwater quality is maintained from the developed site via an enforceable ordinance or other regulatory mechanism.

Existing Post-Construction Site Stormwater Runoff Control activities implemented by the Co-Permittees are as follows:

Post-Construction Ordinance
In 2005, Hamilton County adopted a Construction Site Runoff Control and Post-Construction Site Runoff Control Ordinance. Since January 2007 the County has been implementing a Stormwater Technical Standards Manual. This manual includes requirements and standards for Post-Construction water quality BMP's. The Town of Cicero has passed a resolution adopting the County's Construction and Post-Construction Site Runoff Control Ordinance and the Stormwater Technical Standards Manual.

Plan Review, Site Inspection, and Enforcement:
On January 1, 2006 the Hamilton County Surveyor's Office assumed Rule 5 plan review and enforcement for unincorporated areas of Hamilton County. Projects within the jurisdiction of the Town of Cicero are reviewed and inspected by representatives of the Town. All construction activities and enforcement actions are documented and tracked, and construction activity reports are sent to the Rule 13 Coordinator on a monthly basis.

Training for Construction Professionals
Hamilton County is committed to ensuring that staff members receive adequate stormwater training. In 2007 plan reviewers and inspectors in the Surveyor's Office received a total of more than 340 hours of stormwater related training discussing erosion control and plan review

inspections. Plan reviewers and inspectors for the Town of Cicero also participate in annual training programs.

Inspection and Enforcement Documentation/Tracking Database:
The Hamilton County Surveyor's Office tracks construction activity and enforcement actions. The Surveyor's Office conducts plan reviews of new construction, including plat reviews, detention requirements, construction plans, engineer estimates, and permit applications. Hamilton County and the Town of Cicero submit construction activity reports to the Rule 13 Coordinator on a monthly basis.

Post-Construction BMP Operation and Maintenance Plan/Tracking Database:
Operation and Maintenance Plans for BMP's are outlined in the Stormwater Technical Standards Manual. The County GIS system is being used to map Post-Construction BMP's from as built drawings and on-site inspections for County regulated BMP's. Private BMP's are not mapped or maintained by the County.

5.6 ASSESSMENT OF EXISTING POLLUTION PREVENTION AND GOOD HOUSEKEEPING BMPs

Compliance with this MCM requires MS4s to develop and implement a program to prevent or reduce pollutant runoff from municipal operations within the MS4 Area. The Co-Permittees are currently implementing a number of recommended Stormwater Pollution Prevention BMPs.

Existing Pollution Prevention and Good Housekeeping BMPs implemented by the Co-Permittees are as follows:

MS4 Conveyance System Maintenance Plan and Documentation:
The Hamilton County Buildings and Grounds Department requires clean up of litter, waste, and manure in rental agreements for 4-H buildings and grounds. Interior drains at most County facilities are connected to the sanitary sewer, rather than storm sewers. All County vehicle maintenance with the exception of those vehicles owned and operated by the County Highway Department is done off-site at privately owned facilities.

The County Highway Department vehicle maintenance facility is using secondary containment devices, such as spill trays, to prevent leaks or spills from stored barrels of oil and other petroleum products. The County Highway Department currently maintains all drainage areas that are not regulated drains that are associated with a County Road or the County's right-of-way. The County Highway Department responds to internal and external requests and/or complaints to clean up trash and accumulated litter.

The County Parks and Recreation Department educates maintenance staff on proper handling and storage of all chemicals and equipment fuels. Chemical spill kits are stored at each necessary facility and secondary containment devices are utilize under all refueling tanks at Cool Creek Park, Morse Park, Coxhall Gardens, and White River Campground. Secondary containment devices are also utilized under chemical tanks at North Pool. The Parks and

Recreation Department also regularly acquires floodplain property for parkland and restricts mowing along stream banks.

In the Town of Cicero, vehicle maintenance facilities at Fire Department and Street and Utilities Department are connected to the sanitary sewer system. This ensures that accidental chemical spills outside of secondary containment devices do not end up in storm sewers. The Street and Utilities and the Parks Departments are using secondary containment devices for storage of some chemicals and petroleum products to prevent leaks or spills from entering the storm sewer system. These devices are believed to be functioning properly.

Secondary Containment:
Numerous facilities owned by the Co-Permittees have spill containment areas. The Highway Department has a 500 gallon off-road diesel tank with secondary containment. The County Highway Department vehicle maintenance facility is connected to the sanitary sewer system. This ensures that accidental chemical spills outside of secondary containment devices do not end up in storm sewers. Riverview Hospital's above ground and underground storage tanks are double walled and monitored for leak protection. Riverview stores small quantities of fuel for the visitor transport cart and equipment in cabinets designed for flammable containment and storage. Spill kits are easily accessible in areas throughout the hospital in which hazardous materials are handled and/or stored. Chemicals for boilers are stored in double walled storage tanks within the hospital. In addition, the Hamilton County Airport Authority has completed a SWPP for the Indianapolis Executive Airport, which is located in Boone County. The Cicero Streets and Utilities Department facility is connected to the sanitary sewer system and is implementing secondary containment devices for storage of chemicals.

Sand and Salt Storage:
The County Highway Department's road salt is stored in a covered facility with drains that lead to brine tanks, which are pumped out on an as needed basis. The Highway Department has developed a policy that reduces the amount of sand applied to roads during winter weather events. Other departments using salt also store salt in covered areas. Cicero's salt and sand storage areas are also under cover.

Chemical Spill Response Plan:
Riverview Hospital provides a hazardous materials training program for all new staff employees. Each staff member is trained in handling, storage, and disposal of such wastes. The hospital also requires employees to go through a refresher program and to pass a hazardous material exam on an annual basis. Spill kits are easily accessible in areas throughout the hospital in which hazardous materials are handled and/or stored. The Safety & Risk Management Department visits the HHW facility and other department facilities on a biannual basis or by request, to ensure that they are implementing proper spill containment and prevention techniques, such as the protection of storm drain outlets. The Safety & Risk Management Department manages the Hazardous Communication & Emergency Action Program in which County employees are trained for compliance with OSHA safety standards. The Safety & Risk Management Department responds to spills from County equipment by acting as liaison between County and private companies that perform the clean-up work. In the Town of Cicero, the Fire Department responds to accidents and incidents involving the

spillage of hazardous materials and chemicals and ensures that the all chemicals are properly.

5.7 SUMMARY OF EXISTING BMP ASSESSMENTS

The Co-Permittees has been implementing their Stormwater Program since 2003. Although they are now operating under this joint permit independently from the City of Carmel, the Co-Permittees are confident that they will continue to comply with the requirements of Rule 13 from this point forward. Overall, the Co-Permittees considers their existing stormwater BMPs to have been effective in managing stormwater quality in Hamilton County and the Town of Cicero.

6.0 POTENTIAL PROBLEM AREAS

Rule 13 requires the identification of areas having reasonable potential for or actually causing stormwater quality problems based upon relevant land use data and identified sensitive areas, as well as existing and available water quality data. These areas are required to be given the highest priority for the selection of BMPs and the prohibition of new or significantly increased MS4 discharges. The following discussion summarizes potential problem areas identified for the Co-Permittees' MS4 Area.

6.1 LAND USES

Agricultural land uses account for approximately 79% of land uses within the Co-Permittees' MS4 Area. In order to minimize potential impacts associated with agricultural land uses, the Co-Permittees will encourage local agricultural producers to implement agricultural BMPs, including, but not limited to, conservation tillage, nutrient and pesticide management, buffer strips, and wetland restoration. This can be accomplished through the NRCS.

Urban land uses account for 12% of land uses within the Co-Permittees' MS4 Area. However, growth in the Co-Permittees' MS4 Area is occurring at a steady pace. This trend towards urbanization will likely continue in the near future and it will be important for the Co-Permittees to manage growth and development in a way that minimizes the potential impacts on water quality through continued implementation of their stormwater ordinances, Stormwater Technical Standards Manual, and their Storm Water Quality Management Plan Part C.

6.2 SENSITIVE AREAS

Highly Erodible Soils

As discussed in Chapter 3, approximately 29,035 acres in the Co-Permittees' MS4 Area are classified as highly erodible or potentially highly erodible. Recognizing the potential water quality impacts associated with disturbing these soils, the Co-Permittees have identified these soils as sensitive areas and prioritizes new/redevelopment occurring on these sites during the plan review, inspection, and enforcement process.

Soil Suitability for Septic Systems

The soil suitability data illustrated in Exhibit 5 suggests a high probability for septic system failures within the Co-Permittees' MS4 Area. Since existing controls are in place to address wastewater treatment in new/redeveloping areas, priority will be given to those areas within the Co-Permittees' MS4 Area with known septic system failures or inadequacies.

6.3 EXISTING WATER QUALITY DATA

Existing water quality data and studies related to the Co-Permittees' MS4 Area receiving streams have identified multiple instances of stormwater related pollutants in the Co-

Permittees' MS4 Area receiving streams. Based upon the data evaluated for this report, the subwatersheds identified in the table below should be considered as priorities for the County's Stormwater Program.

Table 6-1 below summarizes watershed specific information and supports the selection of these watersheds as priorities for the Co-Permittees' Stormwater Program. An "X" in the "Multiple Impairments" column indicates that the referenced watershed is listed for more than one type of stormwater impairment. An "X" in the "Recreational Waterway" column indicates that a waterway within that watershed is utilized as a recreational waterway. An "X" in the "Drinking Water Source" column indicates that a waterway within the watershed is utilized as a surface water source or as a surface water supply supplement. An "X" in the "Watershed Study" column indicates that a study identified this particular Co-Permittee watershed as an area of concern or priority.

Table 6-1
Priority Watersheds

Watershed Name	Multiple Impairments	Recreational Waterway	Drinking Water Source	Watershed Study
Bear Creek – West Fork Bear Creek				X
Cool Creek – Grassy Branch/Little Cool Creek				X
Cox Ditch – Christy/Kirgin Ditch	X			X
Duck Creek – Lamberson Ditch	X			X
Duck- Creek - Long Branch				
Geist Reservoir – Bee Camp	X	X	X	
Little Cicero Creek - Bennett Ditch/Taylor Creek				X
Little Cicero Creek - Teeter Branch				X
Morse Reservoir – Bear Slide Creek	X	X	X	
Stony Creek – North Trib	X			X
Stony Creek – William Lock Ditch	X			X
White River – Mallory Grainger Ditch	X	X		
White River - Perkinsville	X	X		
White River – Sugar Run	X	X		
White River – Shoe Maker Ditch		X	X	
White River – Dyer Creek		X		
White River – Vestal Ditch/Michener Ditch		X		
White River – Haverstick Creek		X		
White River – Carmel Creek		X		
Mud Creek – Headwaters				X
Mud Creek – Sand Creek				X

6.4 SPECIFIC LOCATIONS REQUIRING STRUCTURAL BMPS

Rule 13 requires MS4s to identify areas having reasonable potential for causing stormwater quality problems. In order to minimize potential problems associated with the Co-Permittees various maintenance facilities, the facilities listed below have been targeted for BMP implementation as part of the Co-Permittees' Stormwater Program.

Hamilton County Highway Department Vehicle Maintenance Facility
The County Highway Department vehicle maintenance facility is located at 1700 S. 10th Street in Noblesville, Indiana, and is identified as a location in need of structural BMP implementation and maintenance, due the types of chemicals and activities used and stored on-site. The County's Highway Department vehicle maintenance facility will be regularly evaluated for Good Housekeeping and Pollution Prevention Practices throughout the second permit term.

Cicero Streets and Utilities Maintenance Facility
The Town of Cicero's Streets and Utilities maintenance facility is identified as a location in need of structural BMP implementation and maintenance, due to the fact that numerous town-owned vehicles are stored on-site and because the Town's road salt stockpiles are stored at this facility. The Streets and Utilities maintenance facility will be regularly evaluated for Good Housekeeping and Pollution Prevention Practices throughout the second permit term.

7.0 REFERENCES

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